REMARKS

Claims 1, 2, 4-11, and 13-18 were pending. Claims 1, 2, 4-6, 10, 11, and 13-18 have been amended. Claims 19 and 20 have been added. Claims 1, 2, 4-11, and 13-20 are pending.

The Office Action contains instructions for improving the form of the application. More specifically, concerns raised relate to legal phraseology in the abstract, and grammatical inconsistencies in the specification. A replacement abstract is attached to this response, and amendments have been made to the specification, to address the concerns.

Claims 1, 2, 4-11, and 13-18 stand rejected under 35 U.S.C. § 112, second paragraph, based on indefiniteness. Claim 1 has been amended. The claims are submitted as particularly pointing out and distinctly claiming the subject matter of the invention.

Claims 1, 2, 4-11, and 13-18 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 98/50147 in the name of Northrup et al. in view of U.S. Pat. No. 6,180,081 to Poschmann et al. Applicants respectfully traverse this rejection.

Claim 1 recites a reactor for carrying out non-adiabatic catalytic reactions featuring, *inter alia*, a metallic ingot with one or more reaction passages extending through the ingot and being adapted to hold a catalyst for non-adiabatic conversion of a feedstock. Also provided are inlet passages for introduction of the feedstock into the reaction passages, and outlet passages for withdrawing reacted feedstock. The inlet and outlet passages are substantially perpendicular to, and located respectively toward opposing ends of, the one or more reaction passages.

In the present invention, the feed is introduced into the reaction passages through an inlet line arranged within the reactor block. The inlet line runs perpendicularly to the reaction passages. Likewise, reaction products are retrieved through an outlet line which also runs perpendicularly to the reaction passages. As stated in Applicant's previous

response, and as admitted in the Office Actions, supply lines or inlet channels for distributing and supplying feedstock into reaction chambers are not described in Northrup et al. Northrup et al. does not anticipate or render obvious the present invention as recited in claim 1. Claims 2, 4-11, and 13-20 depend directly or indirectly from claim 1, and are submitted as patentable over Northrup et al. for at least the same reasons.

Poschmann et al. does not cure the deficiencies of Northrup et al. Poschmann et al. discloses (see Figures 1 and 2) a reactor made of a bundle of parallel tubes or lengthwise channels 2, with a catalytic burner tube 4 coaxially arranged within each of these channels 2. An annular space 6 is defined so as to allow for the provision of catalyst. Cross channels 7 perpendicular to the channels 2 act as outlets for the product gas, which is then collected in collecting chamber 8 and supplied to a fuel cell, for example. The walls 3 of the channels 2 are porous (membrane walls) so as to allow for the passage of the product, here hydrogen, out through the centrally-located cross channels 7 prior to collection in chamber 8.

The Office Action states that it would have been obvious modify the microfabricated chemical reaction chamber of Northrup et al. based on Poschmann et al. Applicant respectfully disagrees. The reaction device taught by Poschmann et al. differs significantly with respect to the reactor of the present invention in the arrangement of the outlet channels, the materials of the tubes or channels through which the reaction gases travel, the means of collecting the reaction product, and even the heat exchanging medium for sustaining the reaction within the tubes.

Poschmann et al. does not teach or suggest any modification to Northrup et al. that would provide a reactor as recited in claim 1, having inlet and outlet passages disposed substantially perpendicular to, and located respectively toward opposing ends of, the one or more reaction passages. Instead, the skilled person would be deterred from using Poschmann et al. in combination with Northrup et al. For example, Poschmann et al. teaches the application of burner tubes 4 to generate heat for the reaction within the channels 2 (column 2, lines 29-35; column 4, lines 25-36). Northrup et al. features

thermoelectric heating as a key component. The combustion of fuel for the provision of heat is undesirable in Northrup et al., which is used for carrying out sensitive biochemical reactions such as the polymerase chain reaction and/or other DNA reactions. Also, there is no incentive to modify Northrup using Poschmann et al. to include a crosschannel. There is no reason suggested to include a crosschannel in the Northrup et al. reactor, nor is there any suggestion that such a reactor would provide any benefit, including that of high conversion efficiency in the combined reactors as suggested I the Office Action.

Even if a proper combination of Northrup et al. and Poschmann et al. could be made, the present invention would not result. Poschmann et al. teaches a plurality of cross channels 7 along the central portion of the lengthwise channels 2 (see e.g., Figure 2). In the present invention an outlet line (16, 18) for collecting the product gas is provided at the bottom of a reactor block (4, 6), or at the bottom of the parallel reaction channels (8, 10), for example.

Poschmann et al. further teaches to provide the lengthwise channels 2 as tubes having porous walls that act as membranes and allow for the passage of the product gas, which flows out via cross channels 7 into collecting chamber 8 (see e.g., column 2, lines 26-28; column 2, lines 1-4; column 3, lines 65-67). In the present invention, the tubes containing the catalysts, i.e., parallel reaction channels (8, 10) are certainly non-porous as they are in the form of drilled channels (claim 10) in the ingot. As a result and contrary to Poschmann et al. no retrieval of reacted gas along the walls of the channels containing the catalyst is effected. In addition, there is no need in the present invention of having what corresponds to the collecting chamber 8 of Poschmann et al., the removal of which would render Poschmann et al. inoperable. The collecting means in the present invention is the very outlet line (16, 18), which serves to retrieve the product gas.

Claim 1 is patentable over the proposed combination of Northrup et al. and Poschmann et al. Claims 2, 4-11, and 13-20 depend either directly or indirectly from claim 1, and are patentable over the cited references for at least the same reasons.

In view of the above amendment, applicant believes the pending application is in condition for allowance.

Dated: March 16, 2005

Respectfully submitted,

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